Course Information

ECE 358 Foundations of Computing

University of Toronto

Dept. of Electrical and Computer Engineering
Fall Semester, 2022

Course Description

Design and analysis of algorithms and data structures that are essential to engineers in every aspect of the computer hardware and software industry. Topics include recurrences, asymptotics, summations, sorting, search trees and balanced search trees, amortized analysis, hash functions, dynamic programming, greedy algorithms, basic graph algorithms, minimum spanning trees, shortest paths, introduction to NP completeness and new trends in algorithms and data structures.

Learning Objectives

Upon successful completion of this course, you should be able to explain the systematic methods of efficiently organizing and accessing data in data structures and algorithms, identify the properties and structural patterns in data structures,apply abstract data types to the design of data structures, analyze algorithms using a mathematical notation, perform comparative analysis of the typical data structures and algorithms, design and analyze recursive algorithms, write code in pseudocode and high-level programming languages for the implementation of various data structures and algorithms.

Staff

The professor of the course is Professor Shurui Zhou, PT484D (`shuruiz@ece.utoronto.ca`).
Office hours: Fri 3:30-4:30pm (PT484D or via Zoom), or by appointment.

The head TA and tutorial TA for this course is Eric Keilty (`eric.keilty@mail.utoronto.ca`).

ECF Course Email: `ece.algorithms+358@gmail.com` (Course email to be used for general inquiries like questions on material and remarking. This email address goes to TA's only and not to prof's)

Course Piazza link: https://piazza.com/utoronto.ca/fall2022/ece358 (Piazza page to be used for questions on the homeworks. *Announcements will be made on Quercus.*)

Zoom link for office hours: https://utoronto.zoom.us/j/87532808440 (Passcode: 270157)

Lecture Schedule

LEC0101 (Prof. Zhou): Mon (12pm-1pm, BA1190) and Wed (12pm-1pm, BA1190) and Fri (2pm-3pm, BA1190).

Each student is registered in the following tutorial section.

TUT0101 (Eric): Thu (3pm-5pm, BA1190).

In tutorials, questions will be answered about the lecture material, address homework material and solve sample pre-announced problems from the textbook. If you would like your TA to go over specific problems, please let them know in advance via the ECF course email so they can prepare (please include the course code in the subject).

Important Dates

	Due
Homework 1	Monday, Oct 3rd, 11:59pm
Homework 2	Monday, Oct 17th, 11:59pm
Homework 3	Friday, Oct 28th, 11:59pm
Homework 4	Monday, Nov 28th, 11:59pm
Homework 5	Thursday, Dec 8th, 11:59pm
Midterm	Tuesday, Nov 1st, 7pm-9pm

Textbook and Class Contents

The required textbook for this course is T. Cormen, C. Leiserson, R. Rivest, C. Stein (CLRS), "*Introduction to Algorithms*," McGraw Hill 2009 (3rd edition). CLRS is a well-written comprehensive textbook used by most major universities. No other text is required and no lecture notes will be distributed.

In this class we will cover the following material:

- Background: asymptotics, recurrences, combinatorics, randomization, graphs and trees (Chapters 1...5, Appendices A, B and C)
- Sorting: quicksort and analysis, heapsort and analysis, other sorting methods, lower bounds in sorting and selection in linear time (Chapters 6...9)
- Binary Search trees, Red-Black trees, Amortized Analysis, Splay trees, Hashing (Chapters 10...13, 17)
- Dynamic Programming and Greedy Algorithms (Chapters 15 and 16)
- Basic graph algorithms (breadth-first search, depth-first search) (Chapter 22)
- Minimum Spanning Trees and Single Source Shortest Paths (Chapters 23 and 24)
- An Introduction to Maximum Flow (Chapter 26)
- Introduction to theory of computation and NP-Completeness (Chapter 34)
- Introduction to Blockchain Technologies

Course Webpage

All official announcements will be posted on Quercus (`q.utoronto.ca`). *It is your own responsibility to check it at regular intervals, i.e. once per day.* It is strongly recommend to select "Notify immediately" for course announcements in your account notification settings. This will forward all announcements to your university email. Questions on the material (*i.e.,* lectures, exams, tutorials, etc) should be asked during tutorial sessions, on Piazza, or sent to the ECF course email: `ece.algorithms+358@gmail.com`.

On Quercus you will find weekly reading assignments from CLRS and supplementary readings, homework assignments, sample problem solutions, previous exams and other useful resources, including the lecture videos from Fall 2020. All homeworks will be submitted via Quercus.

COVID-19 Measures

For the Fall 2022 term all course activities will be in-person. As such, you must abide by the University of Toronto's vaccination and face mask policy in order to attend in-person lectures and tutorials. Links containing relevant information have been provided below:

- **COVID-19 FAQ**: https://www.viceprovoststudents.utoronto.ca/covid-19/
- **Vaccination Policy**: https://www.utoronto.ca/utogether/vaccines
- **Face Mask Policy**: https://www.utoronto.ca/utogether/masks

Face Mask Requirements During Lecture/Tutorials: The University's mandatory mask requirement is currently suspended. However, the use of a medical mask in high-density indoor spaces when physical distancing is not possible is strongly encouraged. The University is a mask-friendly environment, and we ask everyone to respect each other's decisions, comfort levels, and health needs.

Course Requirements and Grading Scheme

The final grade for this class has three components:

- **homeworks:** There will be five homeworks you will do in groups of 2-3 students. You can switch groups between homeworks but you will receive the group grade each time. More details about proper homework submission are on Quercus. Deadlines for homeworks are final! *Absolutely no late homework will be accepted.* Homeworks account for 25% of your grade (5% each).
- **midterm exam:** There will be one midterm of two hours and it is open CLRS book. The midterm accounts for 35% of the grade.
- **final exam:** Open CLRS book, two and half hours and 40% of the grade.

Exam dates and rooms will be announced at a later time. Exam material will be simpler versions of the problems you will see in the homework. Exam type material will be practiced regularly at tutorials.

Remarking: You have exactly *seven* (7) working days to submit your work (homework or midterm) for remarking from the time marks are released. *There are NO exceptions to this rule and no late homework will be remarked.* To request a remark, state the problem number(s) submitted for remarking, the reason you believe you were marked unfairly, and the name and email address of the group member(s) who should be contacted for clarifications in an email, attach a pdf of your homework and any TA feedback received (e.g. annotations on the homework, rubrics on Quercus, etc.), and send to the ECF course email (`ece.algorithms+358@gmail.com`). If there is a legitimate reason for a late assignment or exam absence (illness, etc.), please email the ECF course email. Keep in mind that official documentation (doctor letter, etc) is required for an exemption. When a homework or midterm is submitted for remarking, the entire document may be regraded (not just the sections you believe were marked unfairly) and *it is possible you will receive a lower mark than before* if we determine the initial grader was too generous.

Cheating Policy

Cheating is against "fair–play" and will not be tolerated under any circumstances. While the pressures of many classes, homeworks, work and/or extracurricular activities can be overwhelming, this is *never* an excuse for copying solutions from others. **The University holds among its highest principles the notion of academic freedom and integrity. Cheaters will face the University's disciplinary committee as well as receive a failing grade in this course.** If you think that there is an issue that influences your performance in the class then talk to the instructor.

How to Get the Most out of this Course

You are urged to read the textbook sections posted in the weekly reading assignments, as it is quite thorough, with many examples and with good motivating discussions and intuitions. The internet is full of additional scientific and historical material. Do a lot of practice problems from the book. Read the course webpage regularly and email the TAs if you have any questions. Attend lectures, tutorials and office hours. Keep up with the pace of the class. Make sure you understand the solution to all homework questions, even if someone else in your group completed it.

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